

Letters to the Editor

Evaluation of Three Commercial Latex Agglutination Tests for Identification of *Campylobacter* spp.[∇]

Latex agglutination tests for the rapid identification of *Campylobacter* spp. have been available in the market for more than 20 years (1, 3). As of November 2007, there were only three commercial latex agglutination tests: PanBio-Campy (jcl) (PanBio Inc., Columbia, MD), the Dryspot *Campylobacter* (Oxoid, Basingstoke, Hampshire, England), and the Microgen M46 *Campylobacter* (Microgen Bioproducts Ltd., Camberley, Surrey, United Kingdom). The only test approved by the Food and Drug Administration of the United States is PanBio-Campy (jcl), which was approved under the name Meritec-Campy (jcl) by Meridian Biosciences, Inc. (Cincinnati, OH; formerly known as Meridian Diagnostics), in 1993. However, as of August 2008, PanBio-Campy will be produced and marketed by Scimedx Corporation (Denville, NJ) under the name CAMPY (jcl).

These latex agglutination tests use polyclonal antibodies to detect antigenic outer membrane proteins or antigenic epitopes from flagella. We evaluated these three test kits in parallel with a variety of *Campylobacter* strains belonging to eight species. These strains have been isolated from clinical and food sources. We also tested these kits with strains of bacteria other than *Campylobacter*, mostly isolated from clinical and food sources. These strains included six *Acinetobacter*

baumannii strains and one strain each of *Arcobacter butzleri*, *Arcobacter skirrowii*, *Listeria monocytogenes*, *Salmonella enterica* subsp. *enterica*, *Salmonella* sp., and *Shigella* sp. These strains were selected based on phylogenetic similarities to *Campylobacter* (*Arcobacter*) spp. and potential growth as contaminants on plate media used for isolation of *Campylobacter* (*Acinetobacter*) spp. (5) and for comparison with other food-borne pathogens (*Listeria monocytogenes*). In December 2007, a new product (*Campylobacter* Latex test, reference no. 96143) was released to the market by Liofilchem Immunology, SRL (Italy), for the identification of *Campylobacter jejuni*. This test was not included in the evaluation. We are not aware of any microbiology company distributing this recent test from Italy in the United States.

Among the *Campylobacter* strains, those numbered *0.07 or *0.08 were isolated from pediatric enteritis patients at the Groote Schuur Hospital, Cape Town, South Africa, in 2007 and 2008, as indicated in Table 1. These isolates were identified to the species level by the protocol outlined by Lastovica (2). The rest of the isolates belong to the culture collection of the Microbiology Laboratory, Department of Poultry Science, Auburn University. These strains are ATCC (American Type Culture Collection) strains or were isolated from food samples

TABLE 1. Strains of *Campylobacter* species used in these studies

Species	Strain(s)	Origin(s)	No. positive/total		
			Microgen	Oxoid	PanBio
<i>C. coli</i>	ATCC 33559, ATCC 43133, ATCC 43473, ATCC 43481, ATCC 49941, ATCC 51798, ATCC BAA-371, 175.07, 193.07, 219.07, 233.07, 1154, 1208, 1214, 1215, 1226, 1228, 1232, 1238, 1245, 1246, 1274, 1314, 1315, 1316, 1318, 1319, 1320, 1321, 1323, 1324, 1326, 1331, 1332, 1334, mCC 66	Human feces, swine feces, turkey feces, retail broiler meat, processed broiler	36/36	36/36	34/36
<i>C. concisus</i>	170.07, 173.07, 184.07, 186.07, 190.07, 196.07, 202.07, 204.07, 211.07, 214.07, 220.07, 226.07, 229.07, 230.07, 241.07, 252.07	Human feces	16/16	0/16	0/16
<i>C. fetus</i> subsp. <i>fetus</i>	221.07	Human feces	1/1	1/1	0/1
<i>C. hyointestinalis</i>	180.07, 208.07	Human feces	2/2	0/2	0/2
<i>C. jejuni</i> subsp. <i>doylei</i>	182.07, 228.07, 188.07, 251.07	Human feces	4/4	4/4	4/4
<i>C. jejuni</i>	ATCC 33560, ATCC 35918, ATCC 700819, 168.07, 178.07, 183.07, 195.07, 199.07, 215.07, 244.07, 4.08, 10.08, 223.07, 225.07, 1003, 1049, 1204, 1207, 1212, 1216, 1229, 1230, 1231, 1233, 1234, 1243, 1262, 1265, 1266, 1269, 1279, 1286, 1288, 1300, 1302, 1303, 1304, 1313, 1317, 1322, 1328, 1329, 1335, 1336, 1337, 1338, 1340, 1341, 1342, 1343, 1345, 1347, mCC 5, mCC 248, CL 90, CL 93	Bovine feces, ovine fetal tissue, human feces, retail broiler meat, processed chicken	55/56	55/56	56/56
<i>C. lari</i>	ATCC 35222, 238.07	Canine feces, human feces	2/2	2/2	2/2
<i>C. upsaliensis</i>	ATCC 43953, 169.07, 172.07, 205.07, 217.07, 232.07, 236.07, 8.08	Canine feces, human feces	7/8	7/8	0/8

TABLE 2. Non-*Campylobacter* species tested in these studies

Species	Strain	Origin	PanBio result	Oxoid result	Microgen result
<i>Acinetobacter baumannii</i>	Cont. CCDA 77	Processed chicken	–	–	–
<i>Acinetobacter baumannii</i>	Cont. CC 76	Processed chicken	+ ^a	–	–
<i>Acinetobacter baumannii</i>	Cont. Line 93	Processed chicken	–	–	–
<i>Acinetobacter baumannii</i>	Cont. 35918	Processed chicken	–	–	–
<i>Acinetobacter baumannii</i>	Cont. 1	Processed chicken	–	–	–
<i>Acinetobacter baumannii</i>	ATCC 15308	NCTC ^b	+ ^c	–	+ ^a
<i>Arcobacter butzleri</i>	ATCC 49616	Human feces	–	–	–
<i>Arcobacter skirrowii</i>	ATCC 51400	Bovine lesions	–	–	–
<i>Listeria monocytogenes</i>	ATCC 19115	Human	–	–	+ ^a
<i>Salmonella enterica</i> subsp. <i>enterica</i>	ATCC BAA-664	Human feces	–	–	–
<i>Salmonella</i> sp.	Clinical isolate	Human feces	–	–	–
<i>Shigella</i> sp.	Clinical isolate	Human feces	–	–	–

^a Large clumping, not an actual agglutination.

^b NCTC, National Collection of Type Cultures (London, United Kingdom).

^c Fine-grain clumping, very similar to regular agglutination.

at Auburn University from 2005 to 2007. *C. jejuni* and *C. coli* strains have been identified with two multiplex PCR assays described elsewhere (4).

Table 1 shows the results of testing 125 *Campylobacter* strains with the three latex tests. The Microgen *Campylobacter* M46 test reacted with 123 strains of all eight *Campylobacter* spp. This test did not react with one *C. jejuni* (1266) and one *C. upsaliensis* (ATCC 43953) strain. Microgen Bio-products specifies that the M46 *Campylobacter* test reacts with thermotolerant species such as *C. jejuni*, *C. coli*, *C. lari*, and *C. upsaliensis* and emerging *Campylobacter* spp. such as *C. jejuni* subsp. *doylei*, *C. concisus*, and *C. hyointestinalis*. The Oxoid test reacted with 105 strains of six *Campylobacter* spp. This test failed to react with one *C. jejuni* strain (1266) and one *C. upsaliensis* strain (ATCC 43953), the same strains with which the Microgen test did not react. According to Oxoid, this test reacts only with thermotolerant species (*C. jejuni*, *C. coli*, *C. lari*, and *C. upsaliensis*). As stated by the manufacturer, the PanBio test reacted only with *C. jejuni*, *C. coli*, and *C. lari*. However, this test did not react with two *C. coli* strains (ATCC BAA-371 and 1315).

The Oxoid test was the only one that did not react with any of the non-*Campylobacter* bacterial strains tested (Table 2). The Microgen test reacted with an *A. baumannii* and a *Listeria monocytogenes* strain, but the reactions were in the form of large clumps and could easily be differentiated from the regular, fine agglutination seen with positive samples. The PanBio test reacted with two *A. baumannii* strains, and although one reaction was also in the form of large clumps, one strain yielded a very fine agglutination that was difficult to differentiate from the agglutination produced by a positive test.

All three tests were simple and easy to use and had a reasonable shelf life when stored as directed by the manufacturer. Of the three tests, the most expensive is the Oxoid test, while the PanBio test is the least expensive. For the analysis of food samples, where *C. jejuni* and *C. coli* are the main suspected species and where large numbers of samples are tested, the PanBio test may be an economical option. However, cross-reactivity was evident with an *A. baumannii* strain, a common

organism growing on agar plates used for *Campylobacter* isolation (5). Therefore, precise identification of *Campylobacter* isolates requires the use of phase-contrast microscopy or Gram staining to avoid misidentifications.

Our results indicate that the Microgen *Campylobacter* M46 test is the most appropriate for the testing of any *Campylobacter* isolates collected from human and food samples, even for *Campylobacter* spp. other than *C. jejuni* and *C. coli*.

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